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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF
LIMITED DISTRIBUTION, NO. 19: MEXICAN FRUIT FLY

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Order: Family

Diptera: Tephritidae

Pest

MEXICAN FRUIT FLY
Anastrepha ludens (Loew)

Economic
Importance

A. ludens is a serious pest of citrus and mango in north-eastern Mexico. Its annual flight from Mexico has established damaging infestations in southern Texas during the winter and spring months. These infestations are usually eradicated naturally by hot weather and the absence of summer hosts. PPQ maintains survey, regulatory, and control programs including grove inspection, spray applications, trapping, fruit fumigation, and the certification of fruit shipped to or through designated citrus areas of Arizona, California, Florida, and Louisiana.

Arizona and California are vulnerable to infestation by the flight of these flies across the international border from northwestern Mexico where large quantities of host material are received from the interior of Mexico. In addition to the many trappings in this area, A. ludens has been trapped once in Florida, February 1972, at Sarasota (as given in a letter from H. V. Weems, Jr., to G. C. Steyskal). PPQ has worked in close cooperation with the Mexican Sanidad Vegetal to prevent establishment in northwestern Mexico. This cooperative undertaking has included the operation of traps, sterile fly release, fruit treatment, road station inspection operations, and quarantine enforcement (U.S. Department of Agriculture 1965, Weems 1967).

In Mexico, A. ludens is sporadic in its attacks and is of chief importance as a pest of late-picked Valencia oranges. In parts of Central America this pest has caused losses, e.g. 70-80 percent of the fruit in orange trees grown at lower elevations in Guatemala. A. ludens ranks ninth in importance as a citrus pest in Central America and Mexico (Ebeling 1959).

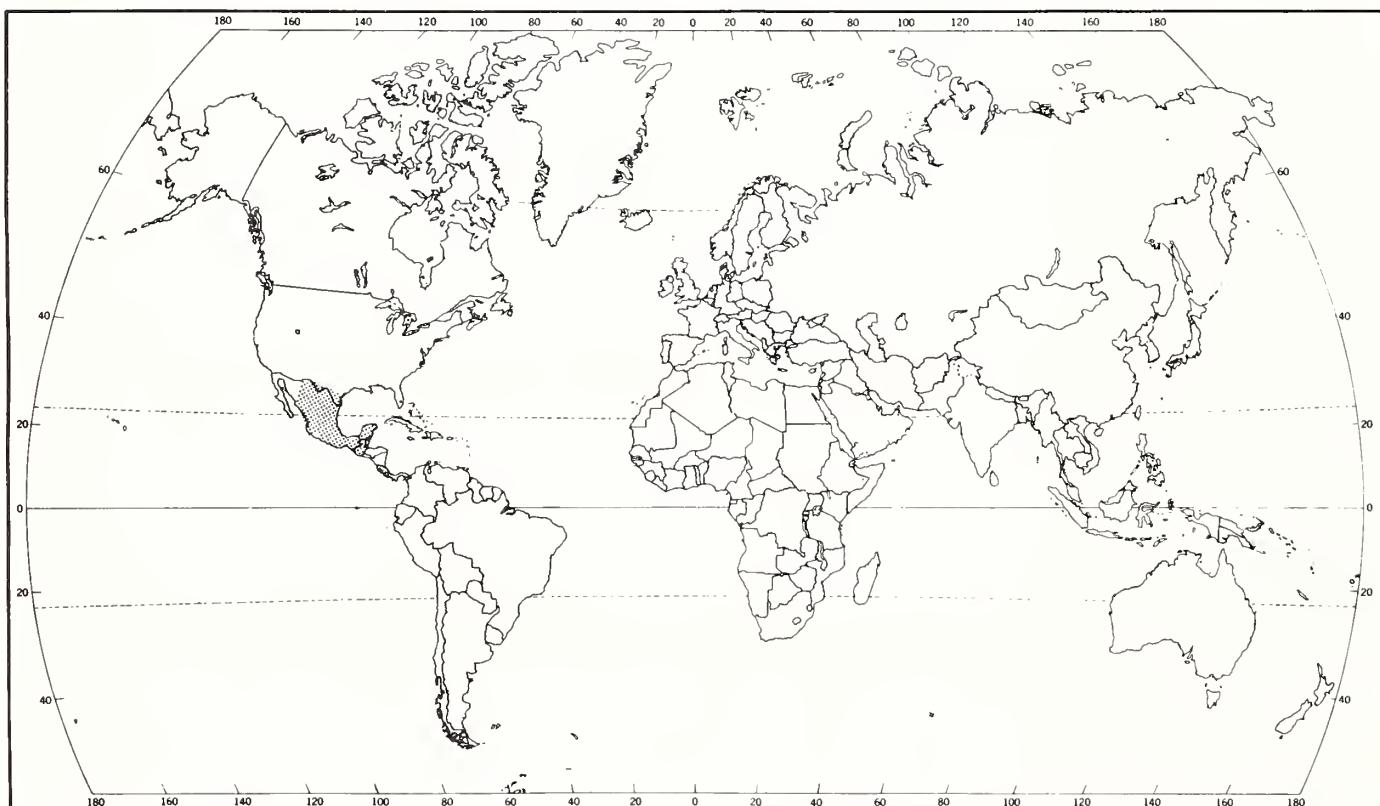
Hosts

This species shares the following hosts with Anastrepha fraterculus (PNKTO 18): Annona cherimola (cherimoya), Citrus aurantium (sour orange), Citrus medica (citron), Citrus paradisi (grapefruit), Citrus reticulata (tangerine), Citrus sinensis (sweet orange), Cydonia oblonga (quince), Malus sylvestris (apple), Mangifera indica (mango), Manilkara zapota (sapodilla), Persea americana

(avocado), Prunus domestica (American plum), Prunus persica (peach), Psidium guajava (common guava), Psidium guineense (Guinea guava), Punica granatum (pomegranate), Pyrus communis (pear), and Syzygium jambos (rose-apple).

Other hosts for A. ludens include: Annona muricata (sour-sop), Annona reticulata (custard-apple), Carica papaya (papaya), Casimiroa edulis (white sapote), Casimiroa tetrameris, Citrus aurantifolia (sweet lime), Citrus grandis (pummelo), Diospyros texana (Texas persimmon, chapote), Gurania suberosa, Inga inicuil, Malpighia mexicana, Mammea americana (mamee-apple), Pouteria sapota (sapota), and Sargentia greggii (yellow chapote) (Oakley 1950, Weems 1967 and 1980).

A. ludens will also infest a number of other fruits and vegetables under laboratory conditions. The fruit of the avocado does not appear to be a primary host, but infested fruits have been intercepted at the Mexican border.



Anastrepha ludens map prepared by USDA, APHIS, PPQ,
Biological Assessment Support Staff

stations. If large numbers of Mexican fruit flies developed on other nearby hosts, they might also become a pest of the avocado (Ebeling 1959, U.S. Department of Agriculture 1965).

General
Distribution

A. ludens is found in Costa Rica, Guatemala, Mexico, and the Rio Grande Valley of Texas (Commonwealth Institute of Entomology 1958, Ebeling 1959). This species is subtropical rather than tropical ranging southward only at higher elevations through Central America and into northern South America (Weems 1967).

Characters

Field Description

ADULTS - About 7-10 mm long, larger than housefly, green eyes, yellowish brown body with small black marking. Somewhat lighter longitudinal markings on thorax, especially on newly emerged flies. Small median dark brown spot on posterior of mesothorax behind wings. Wings transparent where not striped with yellowish-brown bands. Inverted V on lower part of outer half of wing (not connected at tip nor with main pattern) distinguishes this species from other closely related flies. Forward-curved vein M near wing tip, distinctive wing bands, and cylindrical elongation of abdomen (the ovipositor sheath) distinguishes the females of all Anastrepha species from other flies. Ovipositor sheath of female slender, tubelike, and longer than remainder of abdomen (Baker et al. 1944, Ebeling 1959).

Technical Description

ADULTS (fig. A) - Medium sized, yellow brown. Mesonotum 2.75-3.6 mm long, yellow brown, slender median stripe widening posterior to humerus, lateral stripe from transverse suture to pale yellow scutellum; frequently diffuse brownish spot in middle of scutoscutellar suture; pleura yellow brown, stripe from humerus to wing base below notopleuron, and metapleuron pale yellow; metanotum yellow brown, sides of postscutellum darkened, and frequently extending down along sides of metanotum. Macrochaetae brownish black; pile pale yellow brown. Sternopleural bristle present, sometimes very slender. Wing 6.6-9.0 mm long, bands pale yellowish brown; costal and S bands touching vein R or narrowly separated; V band separated from S band or very narrowly connected, usually rather pale anteriorly.

(Fig. A)



A. *ludens*: A. Female adult

Female terminalia: Ovipositor sheath 3.4-4.7 mm long, tapering to apical third, and somewhat expanded and depressed; spiracles 0.85-1.35 mm from base. Rasper of moderate-sized hooks in five to seven rows. Ovipositor 3.35-4.7 mm long, moderately stout, tip elongate, tapering, with few rounded serrations on apical half; shaft at extreme base abruptly widened.

Male terminalia: Tergal ratio about 1:12; clasper about 0.37 mm long, stout basally, flattened apically; outer margin somewhat convex to subtruncate apex; inner margin nearly straight; teeth slightly proximad of middle (Stone 1942).

EGGS - White, spindle shaped.

LARVAE - White, maggotlike, and pointed at one end with visible black mouth hooks. Legless, moving by contraction and expansion of body segments. Length for mature specimens about 9-11 mm long, and 1.5 mm in diameter.

PUPAE - Brown, about 2 mm long.

Fruit fly larvae and pupae are difficult to identify to species level, and much more research is needed. Adult identification is usually based on the female; in most cases males are still indeterminable (Weems 1980).

Characteristic
Damage

Fruit fly damage is often very similar. For this species damage begins when the ovipositing female punctures the fruit for egg laying. The larvae feed on the internal tissues causing breakdown and premature drop of the fruit. The oviposition punctures often heal over and become invisible in cases of mature hosts. Sometimes sap exudation and discolored spots are present. The larvae feed in immature, ripening, or ripe fruits. Usually this feeding is in the pulp, and occasionally on immature seeds. A single larva can render a fruit worthless (Oakley 1950).

Detection
Notes

1. In a detection survey where no fruit flies are known to be present, trap density will vary considerably. More importance should be given to the probability of the fruit fly being present in a given area than to maintaining uniform distance between traps. Generally where preferred hosts are found, traps should be no further than 0.8 km apart. Density should be greatest around areas where flies are likely to be introduced.
2. Areas with high humidity, abundant shade, white grapefruit, and vegetated areas are more likely to attract the Mexican fruit fly.
3. Look for colorful picture-wing flies on fallen fruit.
4. Specific baits and trapping details are available in the PPQ Mexican Fruit Fly Survey Manual (U.S. Department of Agriculture 1965).

Biology

Under laboratory conditions, the first mating began 11-25 days after emergence, and oviposition a few days later. Eggs hatched in about 7 days at a mean temperature of 22°C and larvae developed in the laboratory in 18.5-35 days. The prepupal and pupal stages (in soil) lasted 32 days at 18°C and 21 days at 22°C. Adult life varied greatly in tests, sometimes prolonged to 6 months. The average life cycle normally occupies about 3 months with three

generations developing annually (Oakley 1950). The number of generations per year can range from 1 to over 12. The adult female punctures the rinds and skins of fruits and vegetables then inserts 2-10 eggs. A single female may produce several hundred eggs. The larvae feed by burrowing in the pulp for 10 days to 6 weeks before completing growth. The larvae then leave the fruit and enter the soil within 3-5 cm of the surface (or sometimes in other protected places) and form puparia. Pupation may be completed in 10-50 days. The adults emerge from the puparia and feed on liquids and soluble solids. They mate and the females lay eggs and start the cycle again. The adults overwinter and some species may oviposit successfully after 10 months of inactivity.

Generally, the time elapsed in southern Texas in the spring between oviposition and the emergence of the larva from grapefruit is approximately 3 weeks; the pupal period is about the same. These intervals may vary considerably if conditions are unfavorable, but A. ludens does not naturally spend long periods as a larva in the hosts, nor can the pupal period be extended greatly beyond 90 days, even under the most unfavorable conditions. The adult may live for many months. A. ludens is believed to be capable of flying over 161 km, at least in a series of flights.

In general the factors that influence the life cycle of this species (and most fruit flies) include latitude, season, temperature, rainfall, humidity, availability of food, and natural enemies (U.S. Department of Agriculture 1965, Oakley 1950).

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